

## CLAIMS

1. A matching network for coupling an RF power supply to an RF antenna in a plasma generator, comprising:

a resonantly tunable circuit formed of a variable capacitor and an inductor in a series resonance configuration;

a ferrite core transformer coupled to the resonantly tunable circuit.

2. The matching network of Claim 1 wherein the transformer comprises a secondary winding which couples the transformer to the tunable circuit and a primary winding.

3. The matching network of Claim 2 wherein the secondary winding is a single-turn winding and the primary winding is a multi-turn winding.

4. The matching network of Claim 3 wherein the transformer further comprises a core which is made of a plurality of ferrite cores.

5. The matching network of Claim 2 wherein the transformer further comprises a core which is made of a plurality of ferrite cores.

6. The matching network of Claim 2 wherein the turn ratio between the primary winding and the secondary winding ranges from 3:1 to 8:1.

7. The matching network of Claim 6 wherein the turn ratio between the primary winding and the secondary winding is selected to transform the plasma impedance of the plasma generator to  $50\Omega$ .

8. The matching network of Claim 6 wherein the transformer comprises a core made of 12 ferrite cores with a 1.25 inch OD and 0.75 inch ID, made of M-type ferrite.

9. The matching network of Claim 8 wherein the variable capacitor has a capacity range of 5-125pF.

10. The matching network of Claim 9 wherein the network fits within a cylindrical volume 6 inches in diameter and 8 inches long.

11. The matching network of Claim 1 further comprising an RF power supply connected through a  $50\Omega$  coaxial cable to an input of the matching network and an RF antenna (inductive coil) connected to an output of the matching network.

12. A plasma ion or electron source, comprising:

an RF power supply;

a coaxial cable connected to the RF power supply;

a matching network having an input connected to the coaxial cable, the matching network comprising:

a resonantly tunable circuit formed of a variable capacitor and an inductor in a series resonance configuration;

a ferrite core transformer coupled to the resonantly tunable circuit;  
an RF antenna connected to an output of the matching network;  
a plasma ion or electron generator having the RF antenna mounted therein for inductively generating a plasma.

13. The plasma ion or electron source of Claim 12 wherein the transformer comprises a secondary winding which couples the transformer to the tunable circuit and a primary winding.

14. The plasma ion or electron source of Claim 13 wherein the secondary winding is a single-turn winding and the primary winding is a multi-turn winding.

15. The plasma ion or electron source of Claim 14 wherein the transformer further comprises a core which is made of a plurality of ferrite cores.

16. The plasma ion or electron source of Claim 14 wherein the turn ratio between the primary winding and the secondary winding ranges from 3:1 to 8:1

17. The plasma ion or electron source of Claim 14 wherein the coaxial cable has an impedance of  $50\Omega$  and the turn ratio between the primary winding and the secondary winding is selected to transform the plasma impedance of the plasma generator to  $50\Omega$ .

18. The plasma ion or electron source of Claim 12 wherein the plasma ion or electron generator is a multicusp plasma generator.

19. The plasma ion or electron source of Claim 18 wherein the source is a part of a compact focused ion beam system.

20. The plasma ion or electron source of Claim 19 wherein the matching network fits within a cylindrical cavity 6 inches in diameter and 8 inches long.